

## CLAIMS

1. A large mode field diameter optical fiber which is a single mode fiber having a core and a cladding and wherein the core has an inner core region, at least partially doped with a rare-earth dopant and a co-dopant, and an outer core region at least  
5 partially doped with a dopant, the type and amount of the rare-earth dopant and its co-dopant in the inner core region and of the dopant in the outer core region being adapted to achieve a refractive index in the outer core region that is lower than the refractive index of the inner core region so as to produce a large mode field diameter, exceeding 5.5  $\mu\text{m}$  at a wavelength of 1550nm.
- 10 2. An optical fiber according to claim 1, in which the outer core region includes a plurality of sub-regions each of which may have a different refractive index, provided that overall effective refractive index of the outer region is lower than the refractive index of the inner core region.
3. An optical fiber according to claim 2, in which the outer core region is made  
15 of up to five sub-regions.
4. An optical fiber according to claim 1, in which the ratio of the diameter of the inner core region to the total core region is greater than 0.1.
5. An optical fiber according to claim 4, in which the ratio of the diameter of the inner core region to the total core diameter is in the range from about 0.5 to 0.9.
- 20 6. An optical fiber according to claim 1, in which the relative refractive index of the inner core region is from about 0.3% to 3% and that of the outer core region is from about 0.2% to 2.9%.
7. An optical fiber according to claim 1, in which the rare-earth dopant is

selected from oxides of Er, Yb, Nd, Tb and Tm or a combination thereof, and is present in the inner core region in a molar amount of from 10 ppm to 50,000 ppm.

8. An optical fiber according to claim 7, in which said rare-earth dopant is  $\text{Er}_2\text{O}_3$ .

9. An optical fiber according to claim 1, in which the co-dopant is selected from oxides of Al, Ge, Ti, P and La or a combination thereof, and is present in the inner core region in an amount of from 1 mol% to 40 mol%.

10. An optical fiber according to claim 9, in which said co-dopant is  $\text{Al}_2\text{O}_3$ .

11. An optical fiber according to claim 1, in which the dopant in the outer core region is selected from oxides of Al, Ge, Ti, P and La or a combination thereof, and is present in an amount of 3 mol% to 20 mol%.

12. An optical fiber according to claim 11, in which said dopant is  $\text{GeO}_2$ .